METEOROLOGICAL SERVICE SINGAPORE
Centre for Climate Research Singapore

Developing capacity of Southeast Asian countries to apply subseasonal-to-seasonal forecasts in impact forecasting tools

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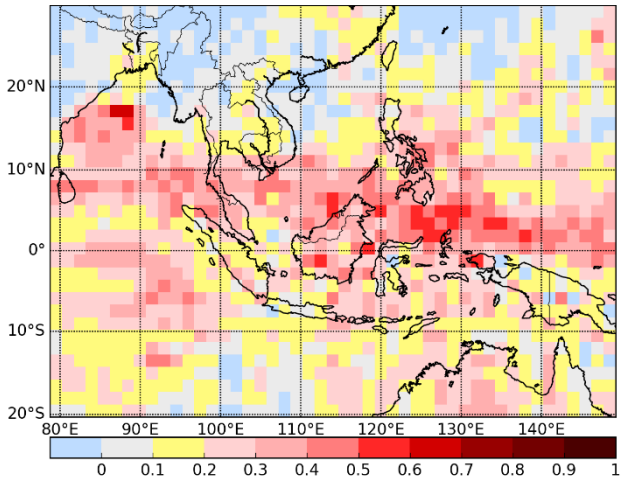
Background - S2S-SEA Capability Building Programme (2017 ~ 2020)

- Involve all **ASEAN NMHSs**, **S2S international experts,** and regional **end-users**
  - Aim: national products by NMHS, and regional products useful to the region.

- Series of four workshops:
  - Workshop 1 Feb 2017
  - Workshop 2 Aug 2018

Workshop 1:Rainfall ACC March
Lead Time 4 Weeks



NHMSs: National Hydrological and Meteorological Services

Current project – ASMC, RIMES, UNESCAP

The mid-term review meeting of the *ASEAN-UN Joint Strategic Plan of Action on Disaster Management 2016-2020* (*JSPADM)* (September 2018, Jakarta) recommended to continue supporting capacity building for S2S.

Five cases studies (as part of deliverables):

- Various **types** of hazardous events (heavy rainfall, drought, *heat waves*) from 2016 onwards
- Explore how S2S could have **improved disaster preparedness** (three models from S2S database: ECMWF, NCEP, UKMO)

Case Study 1: Feb 2016

Overview

Feb 2016

Event dates: end Jan – start Feb

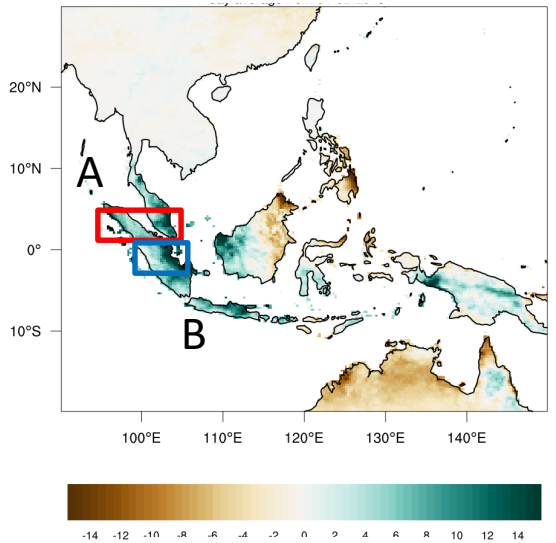
Main rainfall week: **04-10 Feb 2016**

Reported impacts:

1. Indonesia (North Sumatra, Bangka Belitung, Riau, West Sumatra)

2. Malaysia (Negeri Sembilan State, Malacca State, Johor State, Kota Bharu, Kelentan State)

CHIRPS



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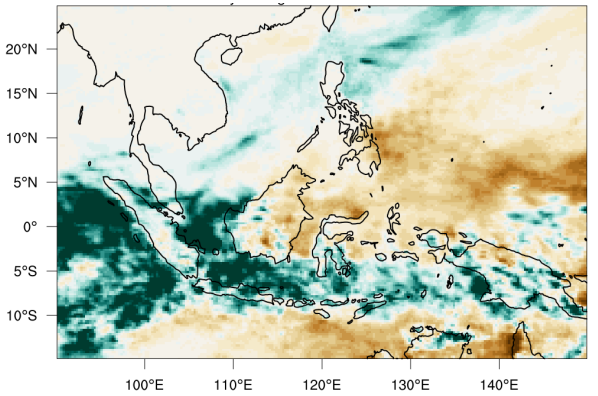


Rainfall anomaly
04-10 Feb 2016
(mm/day)

Overview

Feb 2016

Disaster Impacts: Floods, flash floods, and landslides caused deaths, displacement, damage to houses, bridges, and agricultural damage

Institutional actors: National and local disaster management agencies

Institutional response: Little preparation time (likely only short range forecasts available), mainly evacuation and rescue

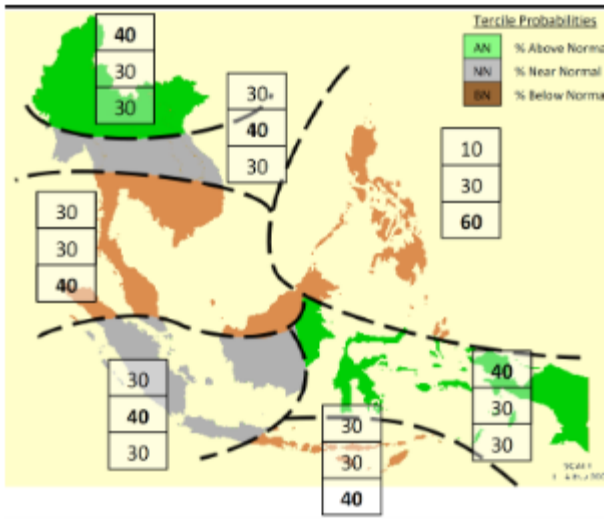
Indonesian Red Cross volunteers and evacuation in Riau province.
(Photo credit: PMI, Riau Chapter)

Background

Seasonal:

- Occurred during El Niño (Indonesia normally considered ‘dry’)
- ASEANCOF seasonal consensus forecast near normal/below normal

DJF 2015/2016



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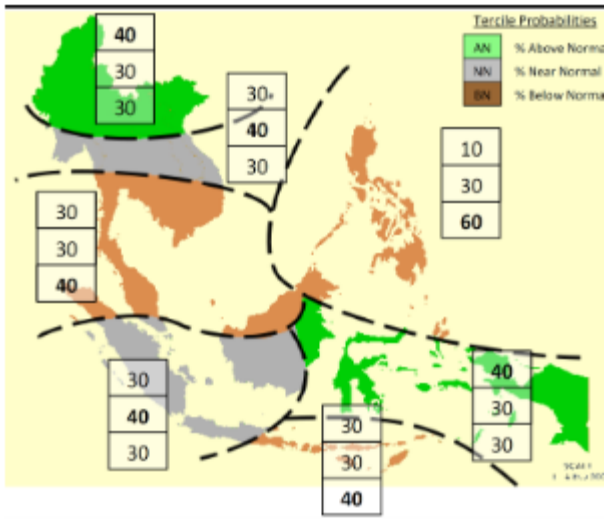
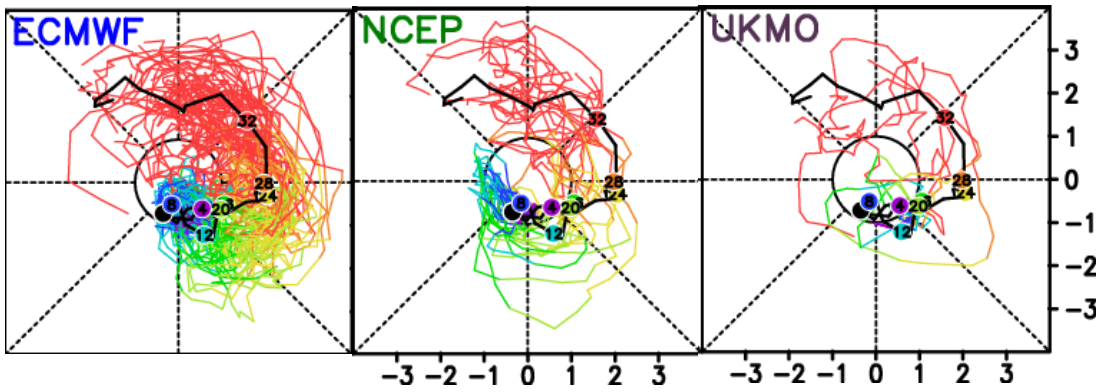


Subseasonal: MJO



Analysis(NCEP)
+0−4days
+4−8days
+8−12days
+12−16days
+16−20days
+20−24days
+24−28days
+28− days

Forecasts from 14 Jan 2016 (S2S museum)

Model forecasts

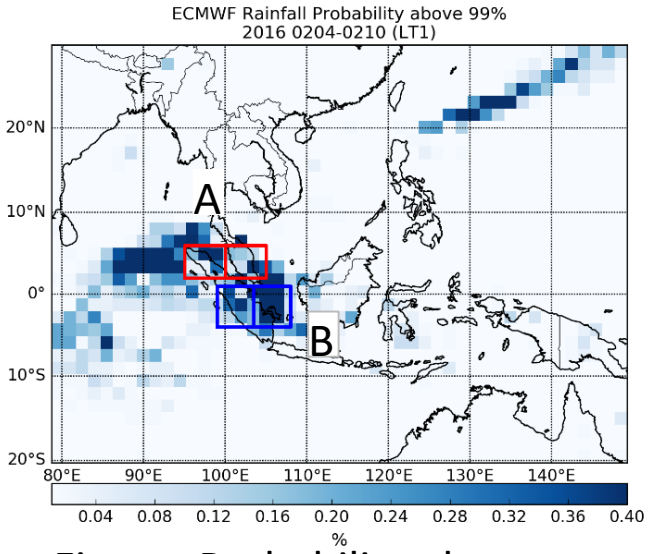


Figure: Probability above 99% 4-10 Feb 2016 (LT 1)

Model forecasts

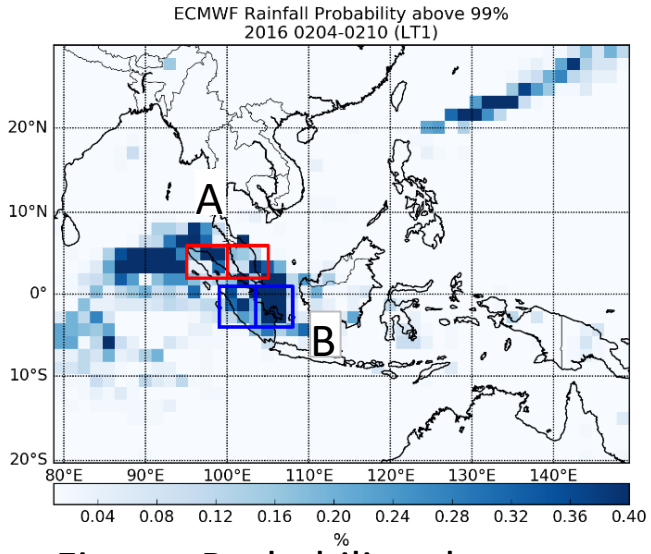


Figure: Probability above 99% 4-10 Feb 2016 (LT 1)

	95%ile			
BOX A WEST	LT 1	LT 2	LT 3	LT 4
28 Jan - 3 Feb	0%	10%	0%	0%
4 Feb - 10 Feb	94%	73%	14%	2%
11 Feb - 17 Feb	0%	0%	0%	2%
	95%ile			
BOX A EAST	LT 1	LT 2	LT 3	LT 4
28 Jan - 3 Feb	0%	0%	0%	4%
4 Feb - 10 Feb	90%	37%	22%	4%
11 Feb - 17 Feb	0%	0%	0%	0%
	95%ile			
BOX B WEST	LT 1	LT 2	LT 3	LT 4
28 Jan - 3 Feb	0%	4%	20%	10%
4 Feb - 10 Feb	96%	75%	41%	10%
11 Feb - 17 Feb	0%	10%	2%	8%
	95%ile			
BOX B EAST	LT 1	LT 2	LT 3	LT 4
28 Jan - 3 Feb	0%	0%	4%	6%
4 Feb - 10 Feb	96%	84%	33%	20%
11 Feb - 17 Feb	0%	29%	20%	22%

Table: Probability above threshold for area average

S2S potential for this case?

Feb 2016

- Clear signals of heavy rainfall over target areas (Western Indonesia and Malaysia) were available at least fortnight in advance;
- National and local disaster management agencies could have prepared for response and evacuation with a much longer lead time
  - E.g. emergency response, housing, agriculture
- Sub-seasonal scale could make **valuable contribution** to disaster and climate risk management by enabling early action, if products become available in real-time and on an operational basis

RIMES

UNITED NATIONS ESCAP
Economic and Social Commission for Asia and the Pacific

Case Study 2: May 2016

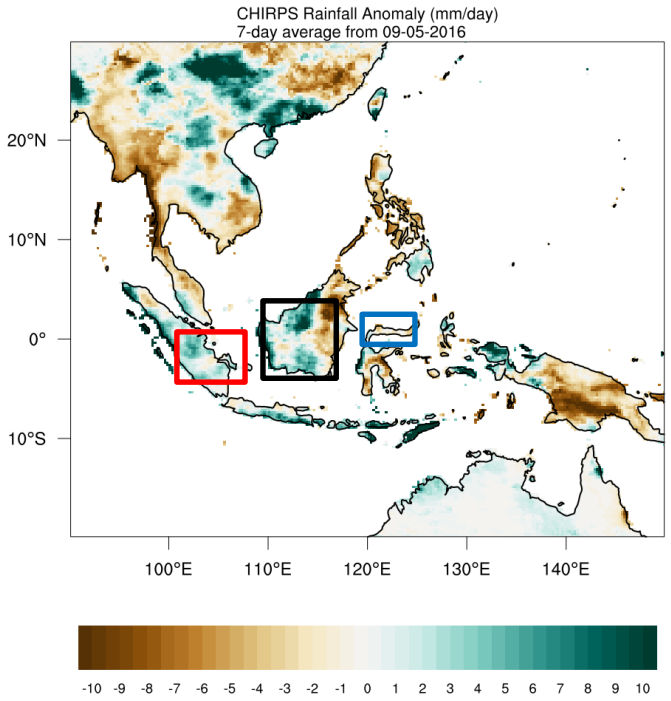
Overview

Event dates: 10- 13 May (Indonesia), end May (Philippines)

Main rainfall week: **09-15 May 2016** (Indonesia), **16-22 May** (Philippines)

Reported flooding: Indonesia (South, West and Central Kalimantan, Bengkulu, Gorontolo)

Reported drought: Philippines recovering from widespread drought



Rainfall anomaly
09-15 May 2016
(mm/day)

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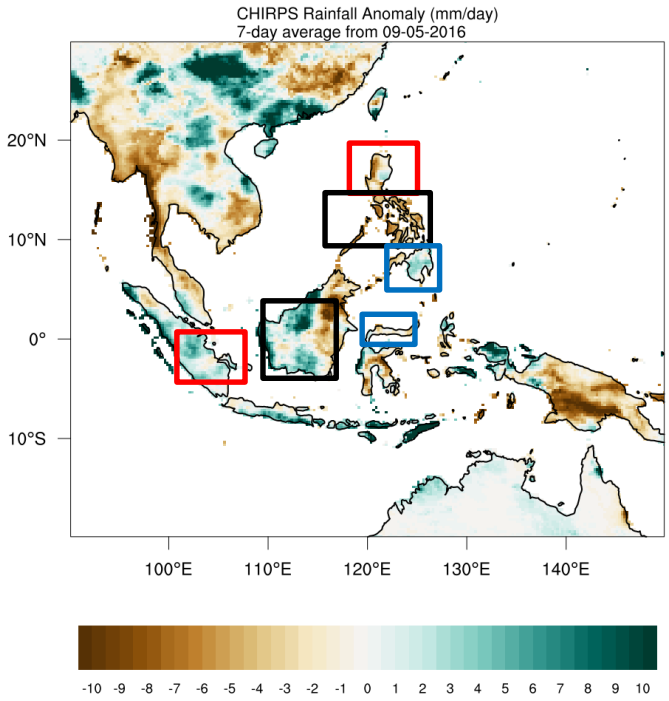


Rainfall anomaly
09-15 May 2016
(mm/day)

Overview

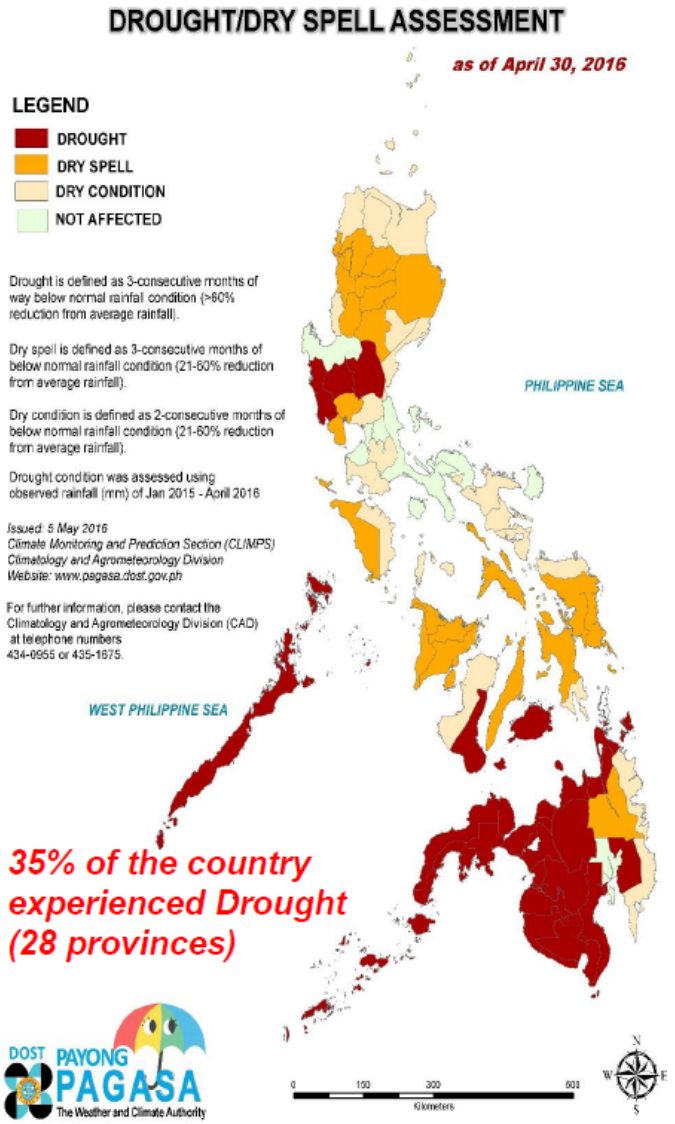
May 2016

Disaster Impacts:

1. **Indonesia**: Floods and flash floods caused deaths, injuries, displacement, damage to housing and agriculture
2. **Philippines:** Widespread agriculture drought since 2015 (40% of country), crop and livestock losses, low food production (high price, low farm income)

Institutional Responses:

1. **Indonesia:** Evacuation, search and rescue
2. **Philippines:** 13 May advisory issued by National DRRM Council



Background

Seasonal:

- Decaying phase of El Niño
- Normally end of the rainy season for Indonesia (so ‘unexpected’ time of year)

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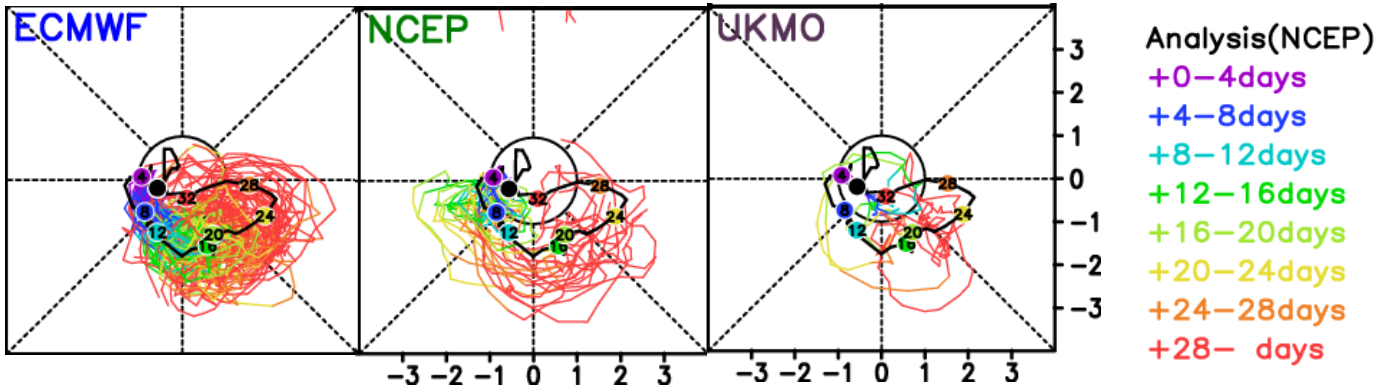

Forecasts from 25 Apr 2016 (S2S museum)

Model forecasts

May 2016

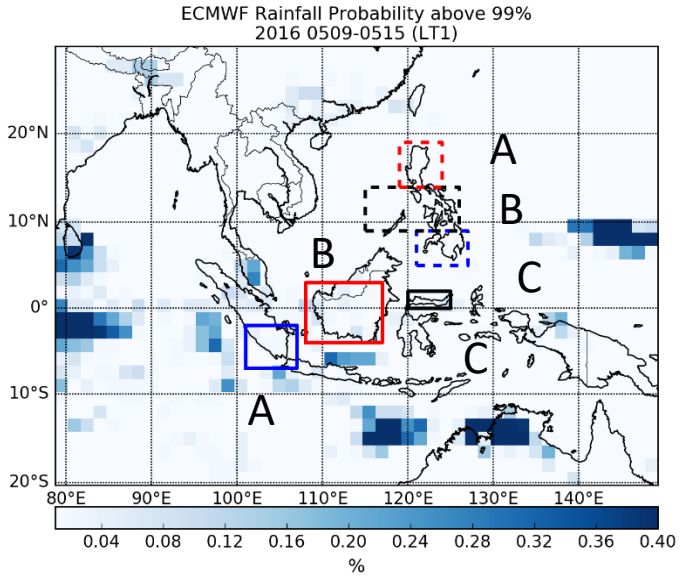

Figure: Probability above 99%
9-15 May 2016 (LT 1)

Model forecasts

May 2016

Table: Probability above/below threshold for area average

	Indonesia				Philippines			
	75%ile				25%ile			
BOX A	LT 1	LT 2	LT 3	LT 4	LT 1	LT 2	LT 3	LT 4
2-8 May	65%	80%	35%		57%	73%	73%	63%
9-15 May	82%	61%	41%	45%	69%	84%	69%	76%
16-22 May	4%	39%	86%	67%	4%	8%	31%	73%
	75%ile				25%ile			
BOX B	LT 1	LT 2	LT 3	LT 4	LT 1	LT 2	LT 3	LT 4
2-8 May	10%	22%	31%	45%	20%	63%	75%	92%
9-15 May	4%	12%	16%	33%	100%	94%	59%	75%
16-22 May	49%	20%	61%	51%	0%	27%	24%	37%
	75%ile				25%ile			
BOX C	LT 1	LT 2	LT 3	LT 4	LT 1	LT 2	LT 3	LT 4
2-8 May	39%	31%	37%	47%	88%	51%	47%	32%
9-15 May	45%	25%	29%	41%	78%	18%	37%	43%
16-22 May	69%	49%	80%	67%	0%	35%	12%	12%

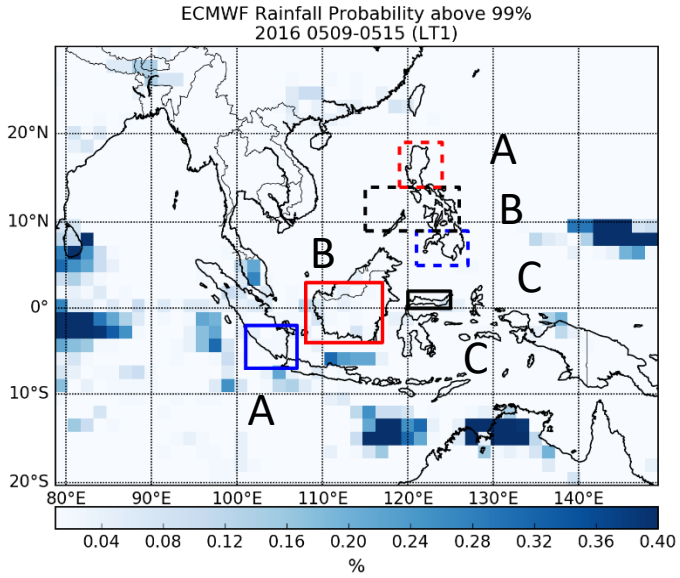

Figure: Probability above 99% 9-15 May 2016 (LT 1)

S2S potential for this case?

May 2016

- Signals of rainfall events over Indonesia not clear, but dry spell over Philippines and its break (in the southern parts of the country) seem to be indicated well
- National DRRMC Council of Philippines **was acting** on El Niño advisories available **on seasonal time-scale** from PAGASA (NMHS). Could have adjusted sectoral strategies much better.
- Indications of **potential usability in** continuation of **dry-spells** and their break.

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Summary

Case Studies

In terms of impacts, the two case studies were not ‘mega-disasters’- but they still can have a large effect on near-poor people.

- Case study 1 demonstrates potential useful information at the S2S timescale
- Case study 2 highlights that S2S can struggle to pick up some events (e.g. flash floods)

Summary

Case Studies

In terms of impacts, the two case studies were not ‘mega-disasters’- but they still can have a large effect on near-poor people.

- Case study 1 demonstrates potential useful information at the S2S timescale
- Case study 2 highlights that S2S can struggle to pick up some events (e.g. flash floods)

→ Still work required for identifying specific areas for preparedness

→ More case studies underway, including plans for pilot locations

→ Plans to engage national level actors during next S2S-SEA workshop

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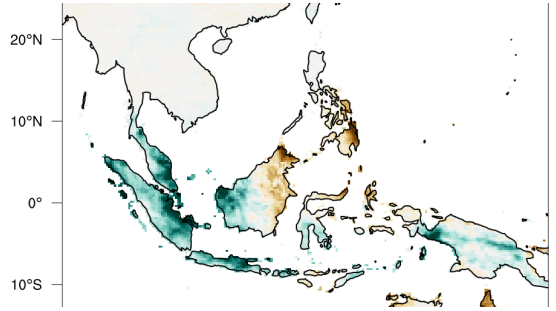
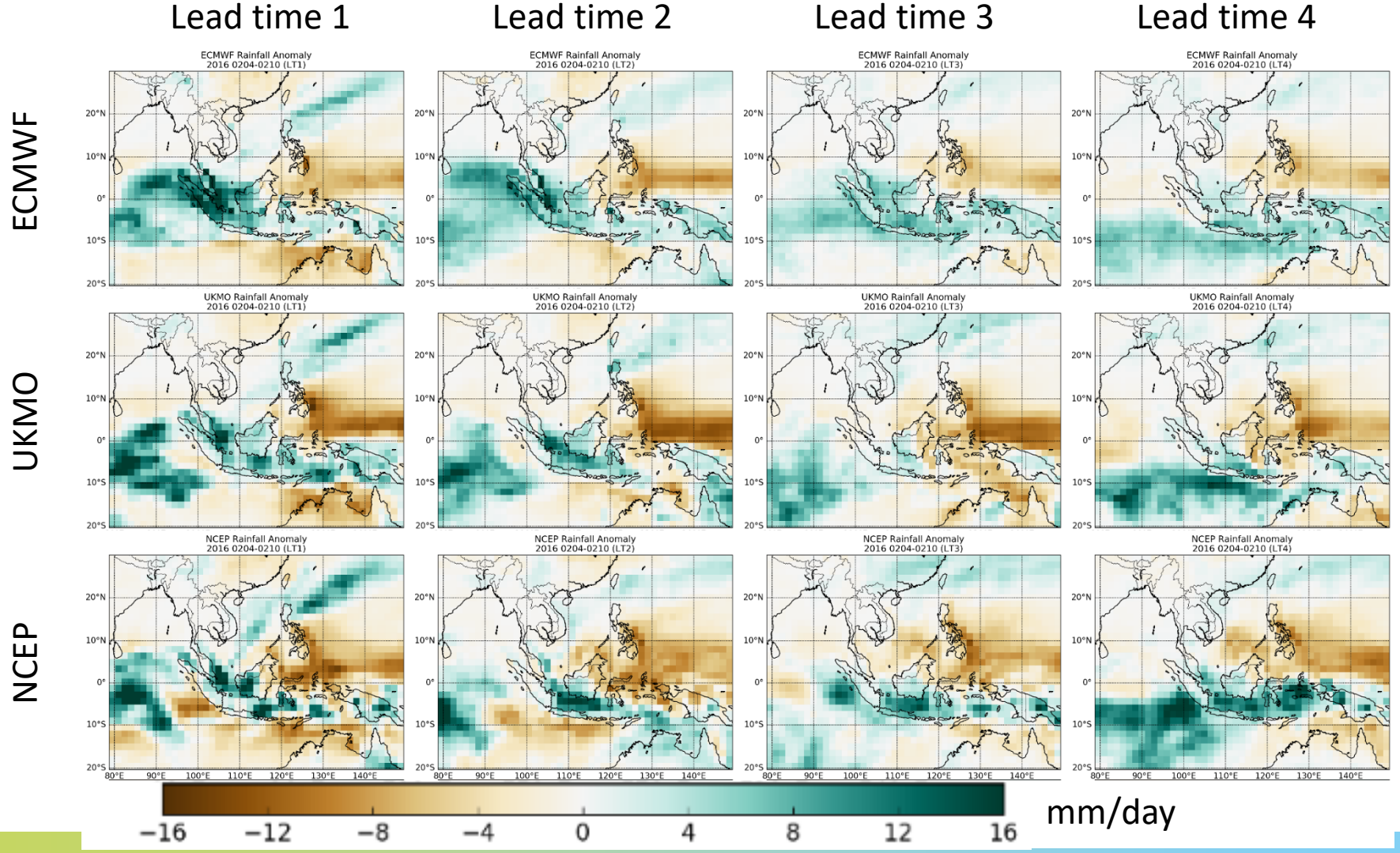
Rainfall anomalies
4-10 Feb





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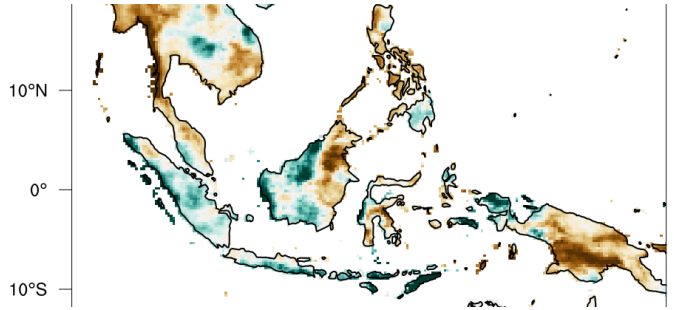
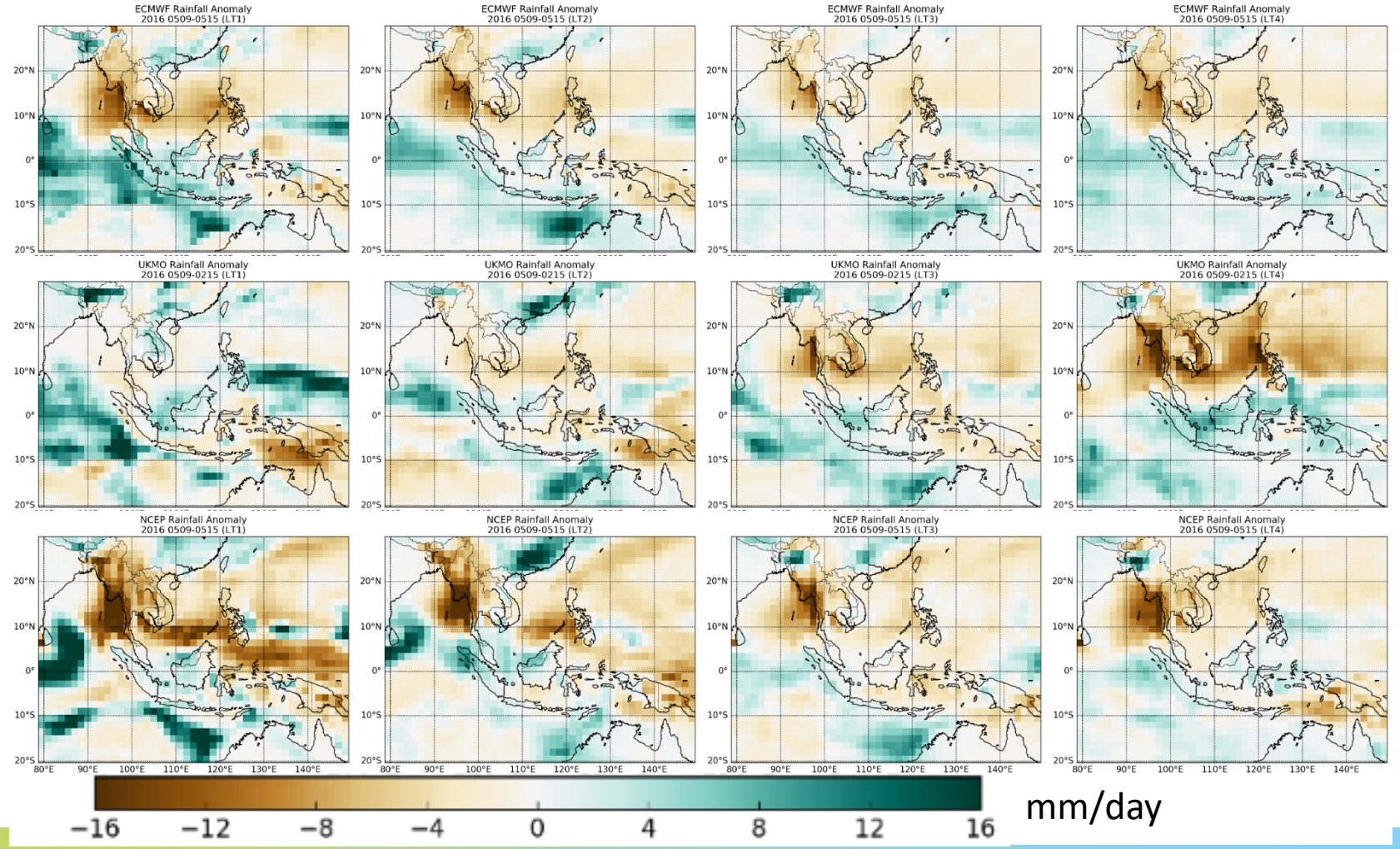


Lead time 1 | Lead time 2 | Lead time 3 | Lead time 4

ECMWF

UKMO

NCEP



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16-22 May

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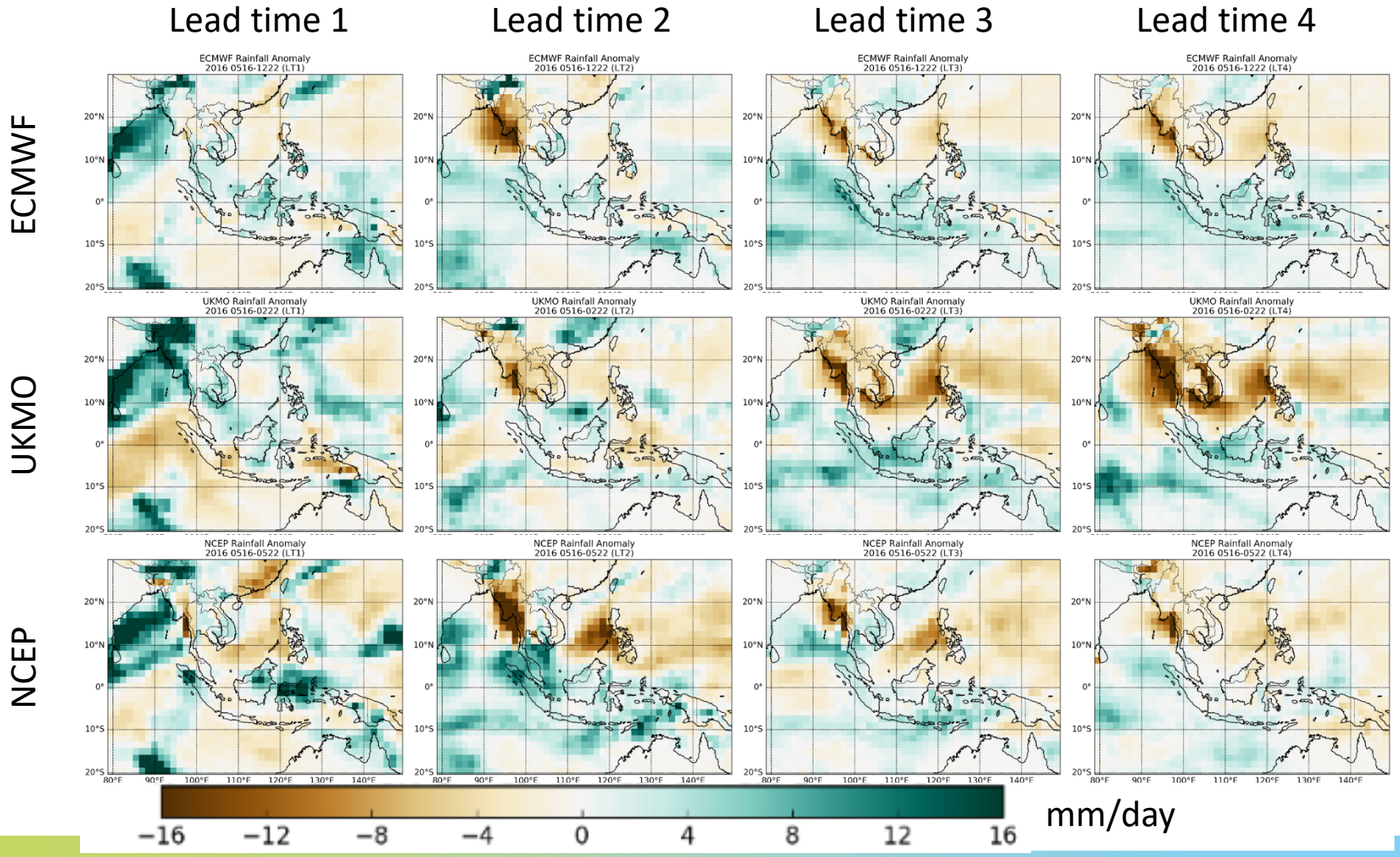

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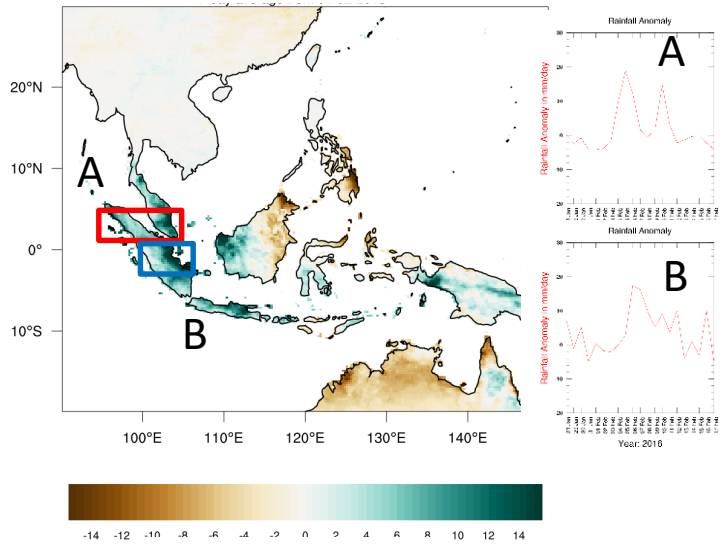

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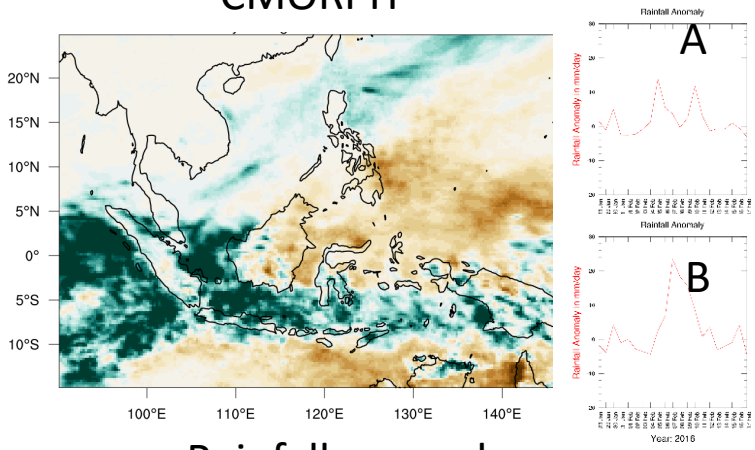

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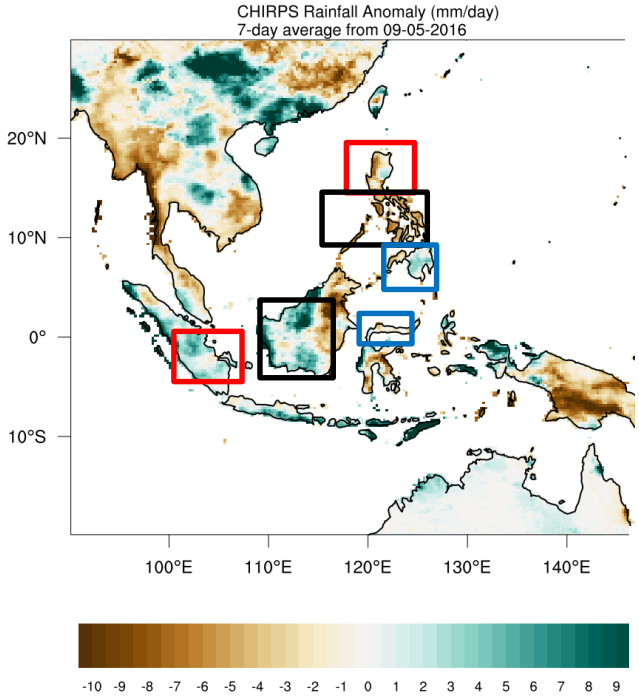

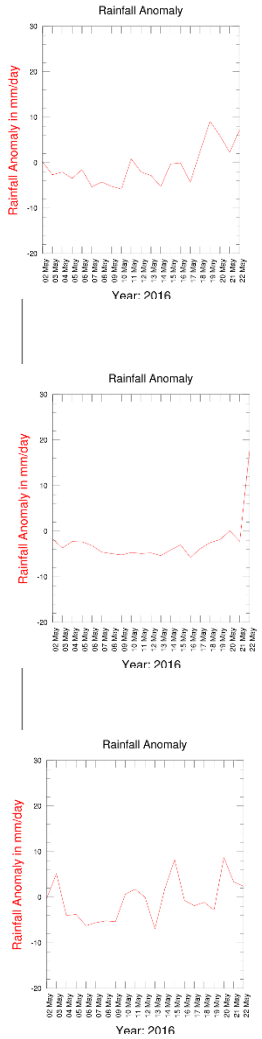

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